

In June last Major Cassel presented to the Society two Trap-door Spiders from Natal. These are still living, but up to Saturday last I had not seen either of them out of their cells; on that day I, after some trouble, got one out, and, as well as I was able, made a sketch of it.

I wrote to the Rev. O. P. Cambridge respecting these Spiders, asking him if he could tell me anything about them; he replied, saying, that he "confidently expected the S.-African Trap-door Spiders would be new to science, as he did not, at that moment, remember anything of the kind of the size I mentioned."

These Spiders have fed principally upon Cockroaches, and the one I had out on Saturday was in splendid condition.

The following papers were read:—

1. Note on the Azygos Veins in the Anurous Amphibia.
By G. B. HOWES, F.Z.S., F.L.S., Assistant Professor of
Zoology, Normal Sch. of Science and R. Sch. of Mines.

[Received February 7, 1888.]

It is customary to regard the presence of the vena cava inferior as a special characteristic of the air-breathing Vertebrata, and the view most generally accepted and taught holds this vessel to be a late development, which replaces the posterior-cardinal veins of fishes. Indeed, some authorities would regard its presence and absence as distinctive of the air-breathing and water-breathing series respectively. Balfour wrote of it¹:—"The venous system of Amphibia and Amniota always differs from that of fishes in the presence of a new vessel, the vena cava inferior, which replaces the posterior cardinal veins, the latter only being present, in their piscine form, during embryonic life."

Chief amongst recent researches into the morphology and development of the venous system are those of Parker^{2,3}, Hochstetter^{4,5}, Meyer⁶. The work of the second-named author will become little short of revolutionary, should his deductions hold good. He claims, as the chief result of his investigations, to have shown that the vena cava inferior, instead of being throughout its whole extent a primarily independent vessel, is a compound structure—the product of a fusion

¹ Comp. Embryology, vol. ii. p. 538.

² "On the Venous System of the Skate," Trans. New-Zealand Instit. vol. xi. 1880, p. 49.

³ "On the Blood-vessels of *Mustelus antarcticus*," Phil. Trans. vol. 177. 1886, p. 685.

⁴ "Beitr. zur vergleichend. Anat. und Entwicklungsgesch. d. Venensyst. der Amphib. und Fische," Morpholog. Jahrb. vol. xiii. 1887, p. 119.

⁵ "Ueb. die Bildung d. hinteren Hohlvene b. d. Säugethieren," Anat. Anzeiger, vol. ii. 1887, p. 517.

⁶ "Ueb. d. Entwicklung des Herzens und d. grossen Gefässstämme b. d. Sela-chiern," Naples Mittheilungen, vol. vii. 1887, p. 338.

between a late-formed hepatic vessel and one or both of the posterior cardinal veins. To that portion which is derived from the cardinal veins, and which receives the venæ renales revehentes, he applies the term "*urniere Abschnitte*"; it is represented, in the adults of the higher forms, by all behind and including the renal veins. He further asserts that whereas in Amphibia the two posterior cardinals become confluent to form this, in Mammalia¹, on the other hand, the cardinal vein of the right side also gives origin to it.

On the completion of the above-named developmental processes the anterior or prerenal portions of the posterior cardinal veins either become modified, to form the azygos and hemi-azygos veins of human anatomy, or, for the most part, disappear. Hochstetter has worked out the steps in the development in *Bombinator*, *Pelobates*, *Rana*, and *Salamandra* among Amphibia. So far as *Bombinator* is concerned, he fully confirms the classical researches of Goette, except for the fact that that author failed to observe the persistence of the entire posterior cardinals in the adult. Hochstetter has shown that in *Bombinator igneus* their anterior portions (morphological azygos veins) not only persist for life, but that with their confluence posteriorly, to form the hinder part of the vena cava inferior, their original continuity is not destroyed. There thus result two well-defined veins (*c.p.* of fig.), which pass upwards and forwards, side by side with the arches of the aorta, putting, as in some *Urodeles*, the fully formed vena cava inferior into direct communication with the veins of the anterior extremities.

In *Rana*, according to Hochstetter, the anterior segments of the posterior cardinals atrophy during metamorphosis. An individual example of the Common Frog (*R. temporaria*, adult ♀) has, however, recently come into my hands², in which the vessel persisted for its entirety on one side (see fig., p. 124)³. Not only so, but its development had continued *pari passu* with that of other related parts—in excess of that seen even in *Bombinator*. The drawing speaks for itself as to detail, and it must suffice to point out that, except as concerned the presence and relations of this vein, no noteworthy difference could be detected between the distribution of even the smaller vessels in this animal and those of the ordinary adult. The least normal among the veins were the ovarian ones (*ov.*), which, as will be seen, were strikingly asymmetrical. There was not the remotest trace of the corresponding portion of the right posterior cardinal.

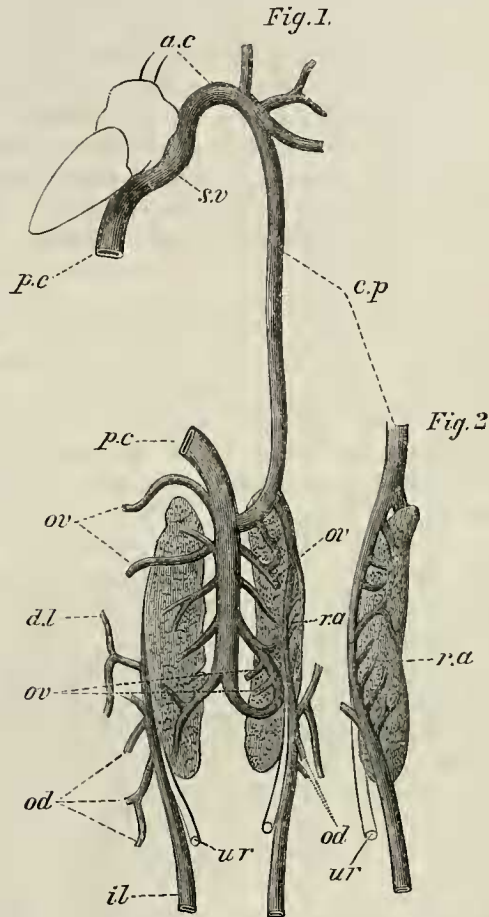
The persistence of this vein in one of the Ranidæ is, in itself, deserving of record; but careful comparison with *Bombinator* has revealed an interesting difference between the two. Hochstetter confirms and extends Goette's discovery that the main trunks of the venæ renales advehentes are primarily continuous with the posterior cardinals, forming trunks (Jacobson's veins) the lower ends of which, subsequently receiving the iliac veins, become the renal portals

¹ Anat. Anz. vol. ii. 1887, p. 519.

² Thanks to the diligence of my pupil, Mr. W. F. Hume.

³ As these sheets were passing through the press I met with the same condition in a male of *Bombinator bombinus*.

of the adult. In *Bombinator*, however, despite the persistence of both renal portal and azygos veins, this continuity is eventually lost. In the specimen of the Common Frog under consideration it persisted,



The venous system of an adult of *Rana temporaria* (♀), showing a persistent azygos (posterior cardinal) vein.

Fig. 1. Ventral aspect.

The vena cava inferior in part removed, and the left kidney turned slightly inwards to display its external dorsal border.

Fig. 2. Left kidney, dorsal aspect. Magnified $1\frac{1}{2}$ times.

a.c., Vena cava superior; *c.p.*, azygos (posterior cardinal) vein; *d.l.*, dorso-lumbar vein; *i.l.*, iliac vein; *od.*, oviducal veins; *ov.*, ovarian veins; *p.c.*, cut ends of vena cava inferior; *r.a.*, venæ renales advehentes; *s.v.*, sinus venosus; *ur.*, ureter.

and the anastomosing trunk received (or gave off) renal branches. This fact is the more surprising, in that in *Pelobates* the separation takes place before metamorphosis, at a period when the anterior segment of the cardinal vein is but feebly developed¹.

¹ Hochstetter, iv. p. 162.

Hochstetter has examined *Bombinator*, *Hyla*, *Rana*, and *Bufo*, and in none but the former has he found a persistence of the vessels above named. He was not in a position to discuss the morphological significance of the fact, as a guide to affinity. The researches of Cope¹, Boulenger², and others point to the conclusion that the Discoglossidæ, rather than the Aglossa, are to be regarded as the least modified of all living Anura. Boulenger writes³, "in the presence of ribs and opisthocœlian vertebræ the members of this very natural family closely approach the higher tailed Batrachians." The retention of the posterior cardinal (azygos) vein in *Bombinator* can only be regarded as a sign of low affinity, and, mindful of the well-known osteological and other characters of this family, I have been led to examine other genera thereof, with the view of ascertaining if this retention is common to all its members. I find the veins of both sides well developed in two specimens (♂ and ♀) of *Bombinator bombinus*. Of five *Alytes obstetricans* examined (three ♂, two ♀), four showed no traces; in the fifth, however (a ♀), both veins were fully represented, but small. This was also the case in a ♂ of *Discoglossus pictus*. From this it must be assumed that the character is fairly distinctive of the Discoglossidæ.

Thanks to Prof. Huxley, I have had the opportunity of examining adults of *Pipa* (♂) and *Dactylethra* (♀). In neither of these could I observe a trace of the vessels in question; the specimens had been previously very much dissected, but should subsequent investigation upon fresh material (which I hope to carry out) substantiate this, the deductions of the afore-named authors as to the lowliness of the Discoglossidæ will receive striking confirmation.

These facts are, in themselves, sufficient to invest any Anura with a fresh interest, whose affinities with the Discoglossidæ have been suggested or called into question. Conspicuous among such is *Pelodytes*; and for an opportunity of examining this and other genera my best thanks are due to Mr. Boulenger, who has, with his customary generosity, afforded me unstinted aid. *Pelodytes* is held by Günther and Mivart⁴ to be allied to the Discoglossidæ, and by others (Cope, Lataste, Boulenger) to the Pelobatidæ⁵. As I am unable to find any traces of the vein in two adult males of *Pelodytes* and one of *Pelobates*, I can but give my support to the latter view.

Finally, Hochstetter, in his earlier paper, describes an anastomosis between the hepatic sinus and the posterior cardinal veins in *Elasmobranchs*⁶, which he holds to be tantamount to the formation of a vena cava inferior. This deduction is far too revolutionary to merit immediate adoption; the probability of its accuracy is, however, cer-

¹ Nat. Hist. Review, 1865; also Journ. of Acad. Nat. Sci. Philadelphia, vol. vi. 1866, p. 67.

² Catalogue of Batrachia Salientia, British Museum, 1882.

³ *Ibid.* p. 444.

⁴ P. Z. S. 1869, p. 280 *et seq.*

⁵ For references, see Cat. Batr. Salientia.

⁶ Cf. Jourdain, Ann. des Sci. Nat. 1859, series 4, vol. xii. Also quoted by Parker, of whose papers Hochstetter does not appear to have been cognizant. This is to be regretted, as the two differ on points of considerable interest.

tainly not lessened by current advance, for Boas has lately shown most conclusively¹ that the pulmonary artery is homologous throughout the vertebrate series.

2. Palæontological Contributions to Selachian Morphology.

By A. SMITH WOODWARD, F.G.S., F.Z.S., of the British Museum (Natural History).

[Received January 17, 1888.]

I. On the Lateral Line of a Cretaceous Species of Scylliidae.

It has long been known that the canal investing the sense-organs of the "lateral line" in Selachian fishes attains, as a rule, to a considerably higher stage of development than in the Chimæroids. While in the latter the canal is merely an open groove, supported by a series of incomplete ring-like dermal calcifications, in the former it assumes a tubular character, opening externally by a row of small orifices, either in its own roof, or through short secondarily developed diverticula.

Only two undoubted exceptions to this rule appear to have hitherto been placed on record. The living *Echinorhinus* is shown by Solger² to have the lateral line in the form of an open groove, though this apparently is not supported by any minute calcifications; and very similar is the lateral line of *Chlamydoselachus*, as described by Garman³. The supposed Liassic Selachian, *Squaloraja*, may also be assumed to have exhibited a similar condition of this organ, the small half-rings originally supporting it being very clearly seen in several fossils recently described before this Society⁴, and agreeing in every respect with those met with in *Ischyodus* and *Chimæra*. Both of the first-named genera, however, are of a comparatively primitive character, and *Squaloraja* shows several other marks of resemblance to the Chimæroids, so that the fact is not unexpected. But I have lately observed suggestive traces of a similarly embryonic lateral line in a most specialized modern type of Selachian; and as this appears to be an unlooked-for novelty, it may be deemed worthy of a brief note.

The Shark in question is a small fossil species, discovered in the Upper Cretaceous strata of Mount Lebanon, Syria, and provisionally assigned by Pictet and Humbert⁵ to the genus *Scyllium*, under the

¹ "Ueb. d. Arterien bogen der Wirbelthiere," Morphol. Jahrb. vol. xiii. 1887, p. 115. See also *ibid.* vol. vii. p. 488, and vol. viii. p. 169.

² B. Solger, 'Nene Untersuchungen zur Anatomie der Seitenorgane der Fische,' Archiv mikr. Anat. vol. xvii. (1880), p. 96.

³ S. Garman, '*Chlamydoselachus anguineus*, Garm., a living species of Cladodont Shark,' Bull. Mus. Comp. Zool. Harvard Coll. vol. xii. no. 1 (1885), p. 3.

⁴ Smith Woodward, 'Note on the Lateral Line of *Squaloraja*,' P. Z. S. 1887, p. 481.

⁵ F. J. Pictet et A. Humbert, 'Nouv. Rech. Poiss. Foss. Mont Liban,' p. 111, pl. xviii. figs. 2-4.